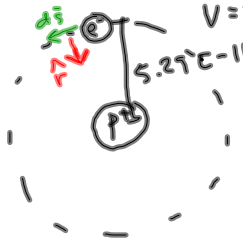
HW 19 Solutions AP Physics

p. 859 #1 :

Need calculus, so don't worry about this for the test



$V = 2.19E6\ m/s$

point where measuring $\bar{B}$ is location of p^+

$$\bar{B} = \frac{\mu_0 I}{4\pi}\int \frac{d\bar{s}\times\hat{r}}{r^2}$$

$|d\bar{s}| = ds$

$d\bar{s}\times\hat{r} = |d\bar{s}\times\hat{r}|\hat{k}$ (out of page)

$= [ds\,(1)\sin(90)]\hat{k}$

$= ds\,\hat{k}$

$$B = \frac{\mu_0 I}{4\pi}\int \frac{ds}{r^2}$$

$$= \frac{\mu_0 I}{4\pi r^2}\int ds$$

$$= \frac{\mu_0 I}{4\pi r^2} S \qquad S = 2\pi r$$

$$= \frac{\mu_0 I}{\cancel{4\pi r^2}} \frac{(\cancel{2\pi r})}{2}$$

$$= \frac{\mu_0 I}{2}$$

$$= \frac{(4\pi E{-}7\ T\cdot m/A)(.00105\ A)}{2(5.29E{-}11\ m)}$$

$= 12.5\ T$

$$I = \frac{\Delta Q}{\Delta t} = \frac{1.6E{-}19\ C}{1.52E{-}16\ s} = .00105\ A$$

find # of times e^- passes a point in 1 second $\frac{1}{t} = \frac{1}{6.58E{-}15\ s}$

$V = 2.19E6\ m/s$

$r = 5.29E{-}11\ m$

$C = 2\pi r = 3.324E{-}10\ m$

$V = \frac{d}{t}$ $\quad t = \frac{d}{V} = \frac{3.324E{-}10\ m}{2.19E6\ m/s} = 1.52E{-}16\ s$

time for 1 trip

we want

p. 861 #25:

at point a, use Ampèrian loop that has a radius of 1 mm

$$B = \frac{\mu_0 I}{2\pi r}$$

$$= \frac{(4\pi E{-}7\ T\cdot m/A)(1\ A)}{2\pi(.001\ m)}$$

$$= 2E{-}4\ T$$

towards the top of the page

at point b, use two Ampèrian loops

$$B = \frac{\mu_0 I_b}{2\pi r_b} - \frac{\mu_0 I_a}{2\pi r_a}$$

$$= \frac{\mu_0}{2\pi}\left(\frac{I_b}{r_b} - \frac{I_a}{r_a}\right)$$

$$= \frac{(4\pi E{-}7\ T\cdot m/A)}{2\pi}\left[\frac{3A}{.003m} - \frac{1A}{.003m}\right]$$

$$= 1.33E{-}4\ T$$

towards the bottom of the page